

# **ENVIRONMENTAL ASSESSMENT**

## **Cooperative Gypsy Moth Project For Indiana 2004**

**by**

**Indiana Department of Natural Resources  
Division of Entomology & Plant Pathology**

**Indiana Department of Natural Resources  
Division of Forestry**

**United States Department of Agriculture  
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## 1.0 PURPOSE AND NEED FOR ACTION

### 1.1 Proposed Action

The Indiana Department of Natural Resources (IDNR), Division of Entomology & Plant Pathology and Division of Forestry, proposes a cooperative project with the United States Department of Agriculture (USDA), Forest Service (USFS) to treat the gypsy moth populations at 39 sites in 13 counties that cover an estimated 60,827 acres (Table 1 & see maps in Appendix B). The preferred alternative for this project is Alternative 5: Btk, mating disruption and/or mass trapping.

Table 1. Number of Treatment Sites and Acres by County and Treatment Method for 2004 (also see Appendix B).

COUNTY	TREATMENT SITES By Treatment Method			TREATMENT ACRES By Treatment Method		
	Btk	Mating disruption	Mass trapping	Btk	Mating disruption	Mass trapping
Allen	5	1	0	1563	12088	0
DeKalb	1	1	0	2	3087	0
Elkhart	8	3	0	1648	28066	0
Kosciusko	0	1	0	0	1307	0
LaGrange	1	0	0	106	0	0
Lake	1	0	0	297	0	0
LaPorte	2	1	0	230	1546	0
Marshall	0	1	0	0	469	0
Noble	1	3	0	2	4215	0
Porter	1	1	0	63	909	0
St. Joseph	0	1	0	0	3299	0
Scott	0	1	0	0	237	0
Whitley	2	3	0	58	1635	0
Totals by Treatment	22	17	0	3969	56858	0
Total of All Treatments	39			60827		

### 1.2 Project Objective

The objective for this cooperative project is to slow the spread of the gypsy moth populations by eliminating reproducing populations from the proposed treatment sites.

### **1.3 Need for Action**

Gypsy moth is not native to the United States, and it lacks effective natural controls. The caterpillars feed on the foliage of many host plants. Oaks are the preferred host species, but the caterpillars defoliate many species of trees and shrubs when oaks are not available. When high numbers of gypsy moth caterpillars are present, forests and trees suffer severe defoliation, which can result in reduced tree growth, branch dieback and even tree mortality. The high numbers of caterpillars also create a substantial public nuisance and can affect human health.

The State of Indiana, with the IDNR, Division of Entomology and Plant Pathology as the lead agency, is dedicated to preserving urban and rural forested habitats from damage by gypsy moth and to enforcing interstate and intrastate quarantines to further protect areas not currently infested by this pest.

If no action is taken, gypsy moth will increase and spread, and defoliation will occur sooner. Therefore, the "no action" alternative is not preferred due to state officials desire to eliminate the isolated infestations, prevent human discomfort associated with infestations, delay damage to local plant communities and reduce spread to adjacent uninfested areas. Local citizens agreed that the "no action" alternative is not preferred through the scoping process (Appendix A).

### **1.4 Decisions to be Made and Responsible Officials**

The preferred alternative in this document proposes cooperative participation of the IDNR and the USFS in treating gypsy moth populations in Indiana. The decision to be made by the responsible USFS officials is to choose which of the alternatives presented in this document best fulfills the objectives of the proposed action, and thus the needs of the people of Indiana. In addition, the decision will have to be made as to whether or not any perceived significant environmental impacts could result from the implementation of this project. If there are none, this will be documented in a Decision Notice and FONSI (Finding of No Significant Impact). If significant environmental impacts are found and the project is to continue, an Environmental Impact Statement (EIS) would be prepared.

The alternatives analyzed for this environmental assessment are: 1) No cooperative project (No action), 2) Btk, 3) Mating disruption, 4) Mass trapping, 5) Btk, mating disruption and mass trapping (Preferred Alternative). The responsible USFS official who will make this decision is:

Michael Prouty, Field Representative, USDA, Forest Service, Northeastern Area, 1992 Folwell Avenue, St. Paul, MN 55108, (651)-649-5276.

The responsible officials for the implementation of the cooperative project in the Indiana IDNR are:

Robert D. Waltz, Ph. D., State Entomologist, Indiana Department of Natural Resources, Division of Entomology and Plant Pathology, 402 West Washington Street, IGC South, Room W290, Indianapolis, IN 46204, (317) 232-4120

Burnell C. Fischer, State Forester, Indiana Department of Natural Resources, Division of Forestry, 402 West Washington Street, IGC South, Room W296, Indianapolis, IN 46204, (317) 232-4105.

## 1.5 Scope of the Analysis

A final environmental impact statement (FEIS), developed by the USDA, Animal & Plant Health Inspection Service (APHIS) and USFS, entitled Gypsy Moth Management in the United States: a cooperative approach (USDA 1995) was made available in November 1995. The Record of Decision for the FEIS was signed in January of 1996 (USDA 1996), and Alternative 6 was selected, which includes all three management strategies analyzed – suppression, eradication, and slow-the-spread. These strategies depend upon the infestation status of the area: generally infested, uninfested, and transition. Implementation of the FEIS preferred alternative requires that a site-specific environmental analysis be conducted to address local issues before federal or cooperative projects are conducted. This site-specific analysis is tiered to the programmatic environmental impact statement (USDA 1995). As part of the analyses conducted for the FEIS, human health and ecological risk assessments were prepared (Human Health Risk Assessment, Appendix F to the FEIS and Ecological Risk Assessment, Appendix G to the FEIS). The purpose of tiering is to eliminate repetitive discussions of the issues addressed in the FEIS (40 CFR, 1502.20 and 1508.28 in Council on Environmental Quality, 1992).

## 1.6 Summary of Public Involvement and Notification

Public meetings were held during February and March 2004 (Appendix A). Notices were delivered to elected officials, interested groups, residents and local media. At each meeting, state officials presented alternatives for gypsy moth management. The discussion included identification and biology of gypsy moth, pest impacts, survey methods, and control tactics. The proposed actions and alternatives, including no action, were discussed. Local issues, questions and concerns raised at the public meetings are included in Appendix A.

Information gathered at the public meetings and from resource professionals was used to develop issues and concerns related to the project. They are grouped into two categories; 1) issues used to formulate alternatives, and 2) other issues and concerns.

## 1.7 Issues Used to Formulate the Alternatives

Each of the major issues is introduced in this section. Discussion pertaining directly to each issue as it relates to the alternatives can be found in Chapter 4.

**Issue 1 - Human Health and Safety.** Three types of risk are addressed under this issue: 1) an aircraft accident during applications, 2) treatment materials and potential effects on people, and 3) the future effects of gypsy moth infestations on people.

**Issue 2 - Effects on Nontarget Organisms and Environmental Quality.** The major concerns under this issue are 1) the impact of treatment materials to nontarget organisms, including threatened and endangered species that may be in the treatment sites, and 2) the future impacts of gypsy moth defoliation on the forest resources, water quality, wildlife and other natural resources.

**Issue 3 - Economic and Political Impacts of Treatment vs. Non-Treatment.** Gypsy moth outbreaks can have significant economic impacts due to effects on the timber resource, nursery and Christmas tree producers, and recreational activities. An additional economic impact is a gypsy moth quarantine imposed to regulate movement of products from the forest, nursery and recreational industries to uninfested areas.

**Issue 4 - Likelihood of Success of the Project.** The objective of this project is reducing the spread rate of gypsy moth within Indiana. Alternatives vary in their likelihood of success for the current situation in Indiana. Measurement of project success is important for delaying gypsy moth impacts to Indiana and neighboring states.

## **1.8 Other Concerns and Questions**

Concerns and questions were discussed during the public meetings (see Appendix A). Also, other agencies were consulted (see Appendix C). Information from these sources was used to develop mitigating measures, management requirements and constraints.

## **1.9 Summary of Authorizing Laws and Policies**

**State.** The Division Director (State Entomologist) may cooperate with a person in Indiana to locate, check, or eradicate a pest or pathogen (Indiana Code 14-24-2-1). The Division Director may, on the behalf of the department, enter into a cooperative agreement with the United States government, the government of another state, or an agency of the United States or another state to carry out this article (Indiana Code 14-24-2-2). Aerial applicators must meet Indiana Pesticide Use and Application Law (Indiana Code 15-3-3.6) to provide safe, efficient and acceptable applications of pesticides. The Non-Game and Endangered Species Conservation law (Indiana Code 14-22-34) applies to this project.

**Federal.** Authorization to conduct treatments for gypsy moth infestations is given in the Plant Protection Act of 2000 (7 U.S.C. section 7701 et.seq.).

The Cooperative Forestry Assistance Act of 1978 provides the authority for the USDA and state cooperation in management of forest insects and diseases. The law recognizes that the nation's capacity to produce renewable forest resources is significantly dependent on non-federal forestland. The 2002 Farm Bill (P.L. 107-171d.) reauthorizes the basic charter of the Cooperative Forestry Assistance Act of 1978.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190), 42 USC 4321 et.seq. requires a detailed environmental analysis of any proposed federal action that may affect the human environment. The courts regard federally funded state actions as federal actions.

The Federal Insecticide, Fungicide and Rodenticide Act of 1947, (7 USC 136) as amended, known as FIFRA, requires insecticides used within the United States be registered by the United States Environmental Protection Agency (EPA).

Section 7 of the Endangered Species Act prohibits federal actions from jeopardizing the continued existence of federally listed threatened or endangered species or adversely affecting critical habitat of such species.

Section 106 of the National Historical Preservation Act and 36 CFR Part 800: Protection of Historic Properties requires the State Historic Preservation Officer be consulted regarding the proposed activities.

USDA Departmental Gypsy Moth Policy (USDA 1990) assigns the USFS and APHIS responsibility to assist states in protecting non-federal lands from gypsy moth damage.

## 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

### 2.1 Process Used to Formulate the Alternatives

Staff entomologists and administration within the IDNR, Division of Entomology and Plant Pathology and the Division of Forestry in cooperation with USDA Forest Service, formulated several alternatives to treat the gypsy moth populations in Indiana under the slow-the-spread strategies (See Chapter 6, Persons and Agencies Consulted).

The FEIS (USDA 1995), which this document is tiered to, allows the USDA to participate in the Cooperative Gypsy Moth Project for Indiana. The USDA can assist in conducting eradication, slow-the-spread and suppression strategies. The FEIS lists the treatment options for each of the strategies (USDA 1995, Vol. II, p.2-15). For the slow-the-spread strategy, the following six treatment options may be considered: 1) *Bacillus thuringiensis* var. *kurstaki* (Btk), 2) diflubenzuron (Dimilin), 3) nucleopolyhedrosis virus (Gypchek), 4) mass trapping, 5) mating disruption (pheromone flakes), and 6) sterile insect release. These treatment options from the FEIS were used as the alternatives for the site-specific analysis of this Environmental Assessment.

### 2.2 Alternatives Eliminated from Detailed Study

The following alternatives that are available were eliminated from consideration:

**Diflubenzuron (Dimilin).** The label for diflubenzuron (Dimilin) prohibits its use over wetlands and directly to water. Some treatment sites contain lakes, marsh, rivers and/or wetlands. Therefore, its use was not considered for this project. This does not preclude the consideration and use of Dimilin in future projects.

**Gypsy moth specific nucleopolyhedrosis virus (Gypchek).** Gypsy moth nucleopolyhedrosis virus (Gypchek) has a very limited supply and is targeted for use in special areas that have high environmental concerns. There are limited data on the effectiveness of Gypchek in low-level gypsy moth populations. It is preferably used in suppression projects against moderate to high gypsy moth populations. Therefore, NPV is not considered for this project. In future projects, it will be evaluated for use.

**Sterile insect release.** The FEIS documents the use of sterile insects for elimination of isolated gypsy moth populations. It also documents the obstacles of using this alternative - the limited release period; need to synchronize production of sterile pupae and release into the population; and the limited availability. This treatment alternative is currently not available, and it has not used in recent eradication or slow-the-spread treatment projects. Giving consideration to these obstacles, this alternative was not considered for this project. In future projects, it will be evaluated for use.

## 2.3 Alternatives Considered in Detail

**Alternative 1 - No action.** If no action is taken, the gypsy moth will reproduce and populations will begin to defoliate trees in the area. Gypsy moth populations will develop and spread to surrounding areas. This is not a preferred alternative because damage and regulatory action will occur sooner than if other alternatives are selected.

**Alternative 2 - Btk.** This treatment option uses one or two applications of Btk at 30 billion international units (BIU) per acre applied from air or ground. The applications would begin when leaf expansion is near 50% and when first and second instar caterpillars are present and feeding. This usually occurs between late April and late May in Indiana. The second application would follow no sooner than four days after the first application. Most commercial formulations of Btk are aqueous flowable suspension (e.g., trade names: Foray, Thuricide) with application rates of 8-48 BIU per acre (Appendix D – example of product labels). For aerial application at 30 BIU, less than 3.0 quarts of the product would be applied per acre.

Btk has been a commonly used treatment option in Cooperative Gypsy Moth Projects in Indiana and other states. Btk is a naturally occurring soil-borne bacterium that is mass-produced and formulated into a commercial insecticide. The Btk strain is effective against caterpillars, including the gypsy moth caterpillar. Caterpillars ingest Btk while eating the foliage. Once in the midgut, Btk becomes active and causes death within a few hours or days (USDA 1995, Vol. II, p. A3-A5). Btk may impact nontarget species of spring-feeding caterpillars in the treatment sites, but the impact to the local population is usually very minimal as Btk rapidly degrades on the foliage within a few weeks, and the nontarget lepidopterans generally re-colonize treatment sites in less than 2 years (USDA 1995, Vol. II, p. 4-52 to 4-55). Human exposure to Btk provides little cause for concern, though direct exposure to the spray may cause temporary eye and respiratory tract irritation in a few people (USDA 1995, Vol. II, p. 4-13).

Btk has proven effective at eliminating gypsy moth at all population levels. Btk applications can meet the project objectives of eliminating gypsy moth populations from all of the proposed treatment sites.

**Alternative 3 - Mating disruption.** This treatment option uses one aerial application of pheromone flakes prior to the emergence of male moths. This would occur in mid-June to early July. Mating disruption relies on the attractive characteristics of the gypsy moth sex pheromone, disparlure. The objective of mating disruption is to saturate the treatment area with enough pheromone sources to confuse the male moths and prevent them from finding and mating with female moths. Mating disruption is considered specific to gypsy moth and is not known to cause impacts to nontarget organism populations, water quality, microclimate, or soil productivity and fertility (USDA 1995, Vol. II, p. 4-67).

Mating disruption involves the aerial application of plastic flake dispensers that are impregnated with the gypsy moth pheromone. The formulation of Disrupt II (see Appendix D – example of product labels) consists of small plastic flakes, approximately 1/32 inch x 3/32 inch (1 x 3 mm) in size, thus the name “pheromone flakes”. A sticker, Monsanto's Gelva 2333, is applied to the flakes as they are dispersed from the aircraft, which aids in the distribution of the flakes throughout all levels in the forest canopy where mating could potentially occur. The flakes are green in color and applied at a rate of 6, 15 or 30 grams active ingredient (disparlure) per acre. At the high rate of 30 grams, 170 grams of flakes are applied in 4 fluid ounces of sticker per acre (4 flakes per sq.ft.) (Reardon et al. 1998). All of the ingredients in the Gelva 2333 sticker are considered non-hazardous to public health if used as an additive in the insecticide formulation (40 CFR 180.1001).



Pheromone flakes have proven effective at eliminating gypsy moth at very low population levels. The application of pheromone flakes can meet the project objectives of eliminating gypsy moth populations from most of the proposed treatment sites.

**Alternative 4 - Mass trapping.** This treatment option places gypsy moth traps at a close spacing within the treatment sites. “The objective of this treatment is to capture male gypsy moths before they have a chance to locate and mate with female moths” (USDA 1995, Vol II, p. A-7). “For mass trapping, delta or milk carton traps are deployed in an intensive grid pattern in an infested area and an adjacent buffer area at the rate of at least 9 traps per acre” (USDA 1995, Vol. II, p. A-8). Thus, it is very labor intensive, especially over large areas. Typically, mass trapping is used on small infestations of less than 40 acres.

Mass trapping has proven capable of eradicating gypsy moth at very low population levels in isolated introductions. The use of mass trapping can meet the project objectives of eliminating gypsy moth populations from some of the proposed treatment sites.

**Alternative 5 - Btk, mating disruption and mass trapping (Preferred Alternative).** The use of this alternative provides flexibility to select Btk, mating disruption, or mass trapping alone or in combination for each site based on the following criteria: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety and 5) cost and project efficiency. The use of this alternative can meet the project objectives of eliminating gypsy moth populations from all of the proposed treatment sites.

## 2.4 Comparative Summary of Alternatives

Table 2. Summary of Environmental Consequences for Alternatives by Issues from Chapter 4

	<b>Issue 1</b> Human Health & Safety (p. 18-19)	<b>Issue 2</b> Effects on Nontarget Organisms & Environmental Quality (p. 19-21)	<b>Issue 3</b> Economic and Political Impacts (p. 21)	<b>Issue 4</b> Likelihood of Success of the Project (p. 22)
<b>Alternative 1</b> <b>No Action</b>	<ul style="list-style-type: none"> <li>- No risk of an aircraft accident or spill.</li> <li>- No risk of Btk contact with humans.</li> <li>- Gypsy moth outbreaks will occur sooner with the associated nuisance and health impacts to humans.</li> </ul>	<ul style="list-style-type: none"> <li>- No direct risk to nontarget organisms, including threatened and endangered species.</li> <li>- Future gypsy moth impacts will occur sooner, which includes defoliation and reduction in the oak component of forest stands.</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory action would occur sooner.</li> <li>- Spread of gypsy moth through these counties and into adjacent counties would not be slowed.</li> </ul>	<ul style="list-style-type: none"> <li>- Gypsy moth would not be eliminated from treatment sites and project objective would not be met.</li> </ul>
<b>Alternative 2</b> <b>Btk</b>	<ul style="list-style-type: none"> <li>- Slight risk of aircraft accident and pesticide spill.</li> <li>- Contact with Btk may cause mild and temporary irritation (eye, skin &amp; respiratory) to a few people.</li> <li>- Delay effect of gypsy moth outbreaks on humans.</li> </ul>	<ul style="list-style-type: none"> <li>- Direct impact on spring feeding caterpillars, temporary reduction in local populations.</li> <li>- No risk to Karner blue butterfly and Mitchell's satyr as neither species occur in or near treatment sites.</li> <li>- No impact to forage base of bald eagle &amp; copperbelly watersnake.</li> <li>- Adverse impact on Indiana Bat is unlikely due to small area of habitat treated.</li> <li>- Delay the impact of gypsy moth defoliation on environmental quality.</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory action would not be implemented in these counties during the current year.</li> <li>- Slows the spread of gypsy moth.</li> </ul>	<ul style="list-style-type: none"> <li>- Success is likely in the treatment sites.</li> </ul>
<b>Alternative 3</b> <b>Mating disruption</b>	<ul style="list-style-type: none"> <li>- Slight risk of aircraft accident.</li> <li>- No effect to human health.</li> <li>- Delay effect of gypsy moth outbreaks on humans.</li> </ul>	<ul style="list-style-type: none"> <li>- No risk to nontarget organisms, including threatened and endangered species.</li> <li>- Delay the impact of gypsy moth defoliation on environmental quality.</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory action would not be implemented in these counties during the current year.</li> <li>- Slows the spread of gypsy moth.</li> </ul>	<ul style="list-style-type: none"> <li>- Success is likely in treatment sites with very low populations.</li> </ul>
<b>Alternative 4</b> <b>Mass trapping</b>	<ul style="list-style-type: none"> <li>- No risk of aircraft accident or spill.</li> <li>- No risk of Btk contact with humans</li> <li>- No effect to human health</li> <li>- Delay effects of gypsy moth outbreaks on humans.</li> </ul>	<ul style="list-style-type: none"> <li>- No risk to nontarget organisms, including threatened and endangered species.</li> <li>- Delay the impact of gypsy moth defoliation on environmental quality.</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory action would not be implemented in these counties during the current year.</li> <li>- Slows the spread of gypsy moth.</li> <li>- Cost is prohibitive in large treatment sites.</li> </ul>	<ul style="list-style-type: none"> <li>- Success is likely in small treatment sites with very low populations.</li> </ul>
<b>Alternative 5</b> <b>Btk, Mating disruption and mass trapping</b>	<ul style="list-style-type: none"> <li>- Same as alternative 2, 3 or 4 depending on the treatment at each site.</li> </ul>	<ul style="list-style-type: none"> <li>- Same as alternative 2, 3 or 4 depending on the treatment at each site.</li> </ul>	<ul style="list-style-type: none"> <li>- Regulatory action would not be implemented in these counties during the current year.</li> <li>- Slows the spread of gypsy moth.</li> </ul>	<ul style="list-style-type: none"> <li>- Success is likely in the treatment sites.</li> </ul>

### 3.0 AFFECTED ENVIRONMENT

#### 3.1 Description of the Proposed Treatment Sites

**Allen County:** There are approximately 422,400 acres in Allen County and 41,200 acres of forest that contain both favorable and unfavorable host species.

**Arcola:** The proposed treatment site contains 13 acres. The site contains trees associated with rural residences, and includes oaks, maples, and conifers. The site was detected in 2003 because a large number of male moths in a trap. An eggmass survey around the high moth catch trap found multiple eggmasses on an oak tree. The surveys indicate a low population, and Btk is proposed for the site.

**County Line:** The proposed treatment site contains 17 acres. The site is composed of woodlots, rural groves of trees and trees associated with rural residences. The tree species present are oaks, maples and other hardwoods. Interstate 69 is west of the site and cell towers occur within and adjacent to the site. The 2003 survey detected a high catch trap and an eggmass survey around the trap detected eggmasses on two properties in the site. The surveys indicate a low population, and Btk is proposed for the site.

**McDuffee:** The proposed treatment site contains 18 acres. The site is composed of trees associated with rural residences and an abandoned railroad. A ditch runs through the site and a cell tower is south of the site. The site was detected in 2002. Eggmasses were detected on one oak in 2002. These surveys indicate a low population. The site was detected to late in 2002 to conduct a treatment. The site was delimited in 2003 and the low population still exists in the site. Btk is proposed for this site.

**Northern Allen County:** The proposed treatment site contains 12,088 acres. The site is composed of woodlots, trees associated with rural residences and subdivisions and farmland. Oak, maple, ash, elm, sycamore, other hardwoods, shrubs and conifers are present. The southern part of the site is suburbs of Fort Wayne and includes the town of Leo. Ditches, creeks, and ponds are scattered throughout the site. High voltage lines, cell towers, schools/day cares and parks occur in the site. The site was detected in 2002 and delimited in 2003. Mating disruption is proposed for the overall site because the population is very low. However, Pine Valley landowners reported numerous caterpillars feeding in 2003, and they treated their yard trees. Btk is proposed for the Pine Valley site because the population is above the threshold for mating disruption.

**Pine Valley:** The proposed treatment site contains 52 acres. The site is a rural subdivision inside the Northern Allen County proposed treatment site. Oaks, maples, other hardwoods, shrubs and conifers are in the site. The site was detected in 2003 from landowner reports. All life stages were found in 2003. Btk is proposed for the site because the population is low.

**Parkview:** The proposed treatment site contains 1,463 acres. The site is an urban residential area of Fort Wayne. Houses, businesses, schools, and medical facilities occur in the site. The urban forest is oaks, ash, elm, maple, other hardwoods, shrubs and conifers. Cell and communications towers occur in the site. Parkview Hospital has construction cranes and a heliport. The site was detected in 2001, delimited in 2002 and 2003. Eggmasses were detected in 2002 and all life stages were detected in 2003. Defoliation was observed in 2003 at Parkview Hospital. Btk is proposed for the site because the population is low.

**DeKalb County:** There are approximately 232,800 acres in DeKalb County and 27,000 acres of forest that contain both favorable and unfavorable host species.

**Southwest DeKalb:** The proposed treatment site contains 3,087 acres. The site is composed of woodlots, urban forest of the town of Laotto, and trees associated with rural residences. The woodlots contain oak, maple, hickory and other hardwoods. Hardwoods and conifers are present in Laotto and the residential areas. There is also a private campground and nature preserve in the site. Highway 3 (major highway) runs through the site. The site was detected in 2002 and delimited in 2003. The survey identified a very low population in the overall site and a low gypsy moth population within the site (Southwest DeKalb Btk1). Mating disruption using pheromone flakes is proposed for the site because of the very low population. Btk is proposed for the Southwest DeKalb Btk1 site.

**Southwest DeKalb Btk1:** The proposed treatment site is 2 acres. The site is in the center of the Southwest DeKalb mating disruption site and is a rural residence with oak and maple trees. The site was detected in 2002 and delimited in 2003. Eggmasses were detected in the site in 2003. These surveys indicate the population is low. Btk is proposed for this site because the gypsy moth population is above the threshold for application of mating disruption.

**Elkhart County:** There are approximately 299,400 acres in Elkhart County and 28,500 acres of forest that contain both favorable and unfavorable host species.

**County Road 1:** The proposed treatment site is 95 acres. The site is woodlots and trees associated with a rural subdivision. The woodlot and subdivision include oaks, maples, ashes, elms, hickories and other hardwoods. The site was detected in 2002 and delimited in 2003. Surveys around the high moth catch trap detected eggmasses in the site. These surveys indicate the population is low. Btk is proposed.

**Elkhart:** The proposed treatment site is 5,127 acres. The site is the northern part of the city of Elkhart. The site includes residences, businesses, factories, hospitals, schools, churches, and parks. The St. Joseph River runs through the site and is the south border for the eastern part of the site. The urban forest consists of maples, oaks, ash, elm, sycamore, other hardwoods and conifers. The Elkhart Airport is northwest of the site. Cell phone and water towers occur in and adjacent to the site. The site was detected in 2002 and delimited in 2003. Eggmass surveys found three locations in the site with eggmasses. The surveys identified a very low population in the site overall, and mating disruption using pheromone flakes is proposed. However, the three locations with eggmasses indicate low populations and Btk is proposed for these core areas (869 acres).

**Elkhart Btk 1:** The proposed treatment site is 148 acres. The site is in the southwest part of the Elkhart mating disruption site. The site is urban residences and contains a city park and hospital. The St. Joseph River runs through the site. Eggmasses were found in the site during 2003. Btk is proposed for the site because the gypsy moth population is above the threshold for application of mating disruption.

**Elkhart Btk 2:** The proposed treatment site is 480 acres. The site is in the western part of the Elkhart mating disruption site. The site is urban residences and businesses. Eggmasses were found in the site in 2003. Btk is proposed for the site because the gypsy moth population is above the threshold for application of mating disruption.

**Elkhart Btk 3:** The proposed treatment site is 241 acres. The site is in the eastern part of the Elkhart mating disruption site. The site is urban residences and businesses. Eggmasses were found in the site in 2003. Btk is proposed for the site because the gypsy moth population is above the threshold for application of mating disruption.

**Goshen Pond:** The proposed treatment site is 819 acres. The site is a suburban area on the south side of the City of Goshen. The Elkhart River runs through the site. The Goshen Pond area on the river is in the middle of the site. Forestland and the wooded residences contain oaks, maple, ash, elm, cottonwood, willow, other hardwoods and conifers. The site was detected in 2002 and delimited in 2003. Surveys did not detect eggmasses in the site. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Middlebury:** The proposed treatment site is 22,120 acres. The site contains woodlots, trees associated with rural residences, and farmland. The southwest corner of the site includes part of the city of Goshen. The Wolf Lake Natural Area is in the west central area of the site and is on the west boundary of the Middlebury Btk 1 site. The tree species throughout the site are oaks, maples, ash, elm, hickory, willow, other hardwoods and conifers. Ditches, creeks, and ponds occur in the site. Cell towers and high voltage lines occur in the site. The site was detected in 2002 and delimited in 2003. Eggmass surveys found four locations in the site with eggmasses. The surveys identified a very low population in the site overall, and mating disruption using pheromone flakes is proposed. However, the four locations with eggmasses indicate low populations and Btk is proposed for these core areas (684 acres).

**Middlebury Btk 1:** The proposed treatment site is 431 acres. The site is in the west central area of the Middlebury mating disruption site and includes woodlots, trees associated with rural residences and fencerows. The Wolf Lake Natural Area is adjacent to the west boundary of the site. Eggmasses were found in 2003, which indicates a low population. Btk is proposed.

**Middlebury Btk 2:** The proposed treatment site is 167 acres. The site is in the northeast area of the Middlebury mating disruption site and includes woodlots, rural groves of trees, trees associated with rural residences and farmland. Eggmasses were found in 2003, which indicates a low population. Btk is proposed.

**Middlebury Btk 3:** The proposed treatment site is 58 acres. The site is in the southeast area of the Middlebury mating disruption site and includes a woodlot and trees associated with rural residences. Eggmasses were found in 2003, which indicates a low population. Btk is proposed.

**Middlebury Btk 4:** The proposed treatment site is 28 acres. The site is in northwest corner of the Middlebury mating disruption site and includes trees associated with a rural subdivision. Eggmasses were found in 2003, which indicates a low population. Btk is proposed.

**Kosciusko County:** There are approximately 384,800 acres in Kosciusko County, and 42,000 acres of forest that contain both favorable and unfavorable host species.

**Lake Wawasee:** The proposed treatment site contains 1,307 acres. The site is an urban forest on the southwestern shores of Lake Wawasee. The site is composed of residences, retail businesses, factories, churches and cottages. The urban forest is composed of maple, ash, oak and other hardwoods. Lake Wawasee forms the north and east border of the site. One wetland is present on the western side of the site. The eastern side of the site was treated in 2001 with mating disruption.

The site was detected in 2002 and delimited in 2003. Eggmasses were not detected in the site. These surveys indicate the population is very low, and mating disruption using pheromone flakes is proposed.

**LaGrange County:** There are approximately 247,500 acres in LaGrange County and 47,100 acres of forest that contain both favorable and unfavorable host species.

**Cass Lake:** The proposed treatment site contains 106 acres. The site is woodlots, rural groves of trees and trees associated with rural residences. Trees include oak, maple, hickory and other hardwoods. There are some ponds in the site and Cass Lake is north of the site. Gypsy moth was detected in 2002 and delimited in 2003. Ground surveys in 2003 found eggmasses and pupae in the site. These surveys indicate the population is low, and Btk is proposed.

**Lake County:** There are approximately 400,800 acres in Lake County, and 11,000 acres of forest that contain both favorable and unfavorable host species.

**Brookwood:** The proposed treatment site contains 297 acres. The site is urban residential and contains houses and businesses. Two golf courses are the east and south border of the site. State Hwy 55 is the west border. A school is located outside of the site from the northeast corner. The urban forest is composed of oak, maple, elm, ash and other hardwoods. Gypsy moth was detected in 2001, delimited in 2002, and treated with Btk in 2003. Wet weather during the application is believed to have impacted the treatment success in 2003. The delimit and eggmass surveys in 2003 still found a low population in the site. Btk is proposed for this site.

**LaPorte County:** There are approximately 392,400 acres in LaPorte County and 59,500 acres of forest that contain both favorable and unfavorable host species.

**150 East:** The proposed treatment site contains 109 acres. The site is forested with rural residences along the county road. The forest contains oaks, maples, hickory, ash, elm and other hardwoods. The site was detected in 2002 and delimited in 2003. Surveys detected eggmasses in the site. These surveys indicate a low population, and Btk is proposed.

**Pinhook Bog:** The proposed treatment site contains 1,546 acres. The site is rural forest and farms with residential subdivisions in the center of the site. The forest area is composed of oaks, maples, other hardwoods and conifers. Wetlands and man-made ponds occur in the site. A high voltage power line runs through the site. Radio towers are located near the site. The Dunes National Lakeshore Area manages 50 acres in the southeast corner of the site. The site was detected in 2002 and delimited in 2003. Surveys in 2003 did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Springville:** The proposed treatment site contains 121 acres. The site is rural forests, farmland, an industry and residences. The forest contains oaks, hickory, maple, ash, elm and other hardwoods. State Highway 39 runs through the site. The site was detected in 2002 and delimited in 2003. Surveys detected eggmasses in the site. These surveys indicate a low population, and Btk is proposed.

**Marshall County:** There are approximately 288,000 acres in Marshall County and 32,200 acres of forest that contain both favorable and unfavorable host species.

**Juniper 04:** The proposed treatment site contains 469 acres. The rural site contains woodlots, farmland and rural residences. The woodlots contain oak, maple, black cherry, hackberry and other hardwoods. A railroad runs through the site. Gypsy moth was detected in 1999 and delimited in 2000, 2001 and 2002. In 2001, eggmasses were found on two trees and were destroyed. Only four eggmasses were found in 2002. A woodlot in the southeast corner of the site was treated with Btk in 2003. Surveys did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Noble County:** There are approximately 267,300 acres in Noble County, and 31,400 acres of forest that contain both favorable and unfavorable host species.

**300 South:** The proposed treatment site is 2 acres. The site is a rural farm residence with hardwood trees in and surrounding the yard. Crop fields surround the site on three sides and a woodlot is north of the site. The site was detected in 2002 and delimited in 2003. Eggmasses were found on yard trees. These surveys indicate a low population, and Btk is proposed.

**Big Lake:** The proposed treatment site contains 442 acres. The site is west of Big Lake and the shoreline of Big Lake is the boundary of the site. The site contains woodlots, trees associated with residences around Big Lake, other rural residences, and farmland. The trees are various hardwood species including mature oak. The site was detected in 2002 and delimited in 2003. No eggmasses were found in the site. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Kendallville:** The proposed treatment site contains 2,987 acres. The site is east of Kendallville and contains woodlots, trees associated with rural residences, a small lake and ponds, open fields and cropland. Trees include oak, maple, ash, walnut, pine and other hardwoods. There is a high voltage line west of the site and cell towers inside and near the site. Highway 6 (major highway) runs through the site. Gypsy moth was detected in the site in 2002 and delimited in 2003. No egg masses were found during the 2003 survey. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Miriam Chapel:** The proposed treatment site contains 110 acres. The rural site contains woodlots, trees associated with rural residences and farmland. Trees include oaks, maple, ash, and other hardwoods. The same species are present around the residences including conifers. U.S. Highway 33 and state highway 9 run through the site. Cell and communication towers are in and near the site. The site was detected in 2002 and delimited in 2003. No eggmasses were detected. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**South East Noble:** The proposed treatment site contains 676 acres. The rural site contains woodlots, trees associated with rural residences and farmland. Trees include oaks, maples, ash, elm other hardwoods and conifers. Ditches, creeks and ponds occur throughout the site. State Highway 205 and high voltage power lines run through the site. The site was detected in 2002 and delimited in 2003. Surveys did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Porter County:** There are approximately 333,700 acres in Porter County and 29,000 acres of forest that contain both favorable and unfavorable host species.

**Cobbs Corner:** The proposed treatment site contains 63 acres. The rural site contains woodlots, rural residences and a church. Trees include oaks, maples, ash, elm, other hardwoods and conifers. The site was detected in 2002 and delimited in 2003. Surveys detected eggmasses on several oaks on the church property. These surveys indicate a low population, and Btk is proposed.

**Crisman:** The proposed treatment site contains 909 acres. The site is suburban with forests and wooded subdivisions and trailer parks. The forests consist of oaks, maples, hickories, elms, ash and other hardwoods. The site was detected in 2002 and delimited in 2003. Surveys did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**St. Joseph County:** There are approximately 294,900 acres in St. Joseph County, and 22,100 acres of forest that contain both favorable and unfavorable host species.

**South Bend West:** The proposed treatment site contains 3,299 acres. The site is west of South Bend. The site is “urban residential” containing houses, businesses, churches and schools. The forest is mainly oak mixed with maple, black walnut, black cherry, other hardwoods and landscape trees such as spruce, crabapple and ash. Three highways run through the site. One small lake occurs in the site. The South Bend Airport is north of the site. The site was detected in 2002 and delimited in 2003. Surveys did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Scott County:** There are approximately 123,400 acres in Scott County and 47,000 acres of forest that contain both favorable and unfavorable host species.

**Crothersville:** The proposed treatment site contains 237 acres. The site is forests, rural residences and farmland. The forest contains oak, hickory, beech, maple, yellow poplar and other hardwoods. The site was detected in 2002 and delimited in 2003. Surveys did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Whitley County:** There are approximately 218,200 acres in Whitley County, and 27,800 acres of forest that contain both favorable and unfavorable host species.

**Blue Lake:** The proposed treatment site contains 1,546 acres. The site is woodlots, trees associated with rural residences and farmland. Trees include oaks, maple, hickory and other hardwoods. Conifers are present in the yards of residences. The shore of Blue Lake is the south boundary of the site. Ponds and creeks are present throughout the site. The site was detected in 2002 and delimited in 2003. Eggmasses were not detected in the site. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

**Churubusco:** The proposed treatment site contains 56 acres. This site is within the city limits of Churubusco. The site contains residences, a city park and a forested area. The city park in the treatment site contains ball fields and a tennis court. The city park has mature oak trees. The residential area of the site contains oak, hickory, maple, spruce, pine, and shrubs. The site also contains a woodlot composed of oak, hickory and other hardwoods. There are light towers within and near the site associated with the ball fields. Outside the south boundary of the site is an elementary and high school.



Surveys in 2000 and 2001 detected the presence of gypsy moth near this site. In 2002, moth catches indicated a low population. Egg masses were found in the city park in 2002. Btk was applied to the site in 2003. Wet weather during the application is believed to have impacted the treatment success. The delimit and eggmass surveys in 2003 still found a low population in the site. Btk is proposed for the site.

**Riley Rd:** The proposed treatment site contains 2 acres. The site is rural fencerows that contain oaks and maples. The site was detected in 2002 and delimited in 2003. A survey detected an eggmass on one tree. These surveys indicate a low population, and Btk is proposed.

**Walnut Corner:** The proposed treatment site contains 89 acres. The site is woodlots and trees associated with rural residences and contain oak, ash, maple, sycamore, other hardwoods, and conifers. State Highway 205 and a high voltage line run through the site. A school is northeast of the site. The site was detected in 2002 and delimited in 2003. A survey did not detect eggmasses. These surveys indicate a very low population, and mating disruption using pheromone flakes is proposed.

### 3.2 Threatened and Endangered Species

Consultation with the staff of the U.S. Fish and Wildlife Service determined that neither of the federally endangered species Karner blue butterfly (*Lycaeides melissa samuelis*) and Mitchell's satyr butterfly (*Neonympha mitchelii*) are known to occur near the sites proposed for treatment using Btk. The use of pheromone flakes are considered to be highly specific for gypsy moth with no adverse impacts on federally listed butterflies. (Appendix C – U.S. Fish & Wildlife Letter).

The treatment sites are within the range of the federally endangered Indiana bat (*Myotis sodalis*), bald eagle (*Haliaeetus leucocephalus*) and copperbelly watersnake (*Nerodia erythrogaster neglecta*). The U.S. Fish and Wildlife Service concluded "Since the current Bt spraying program is limited to relatively small areas of Indiana bat habitat, and the link between loss of a lepidopteran forage base and adverse effects on the species is uncertain, we conclude that the 2004 program is not likely to adversely affect any of these listed species." They "do not anticipate impacts on the forage base of bald eagles or copperbelly water snakes from any treatments" (Appendix C – U.S. Fish & Wildlife Letter).

The IDNR, Environmental Unit reviewed the project. They identified Wolf Lake Natural Area adjoining one Btk site and have concern for impacts to native lepidopteran at this location, but have no documented occurrence of any rare species in the area. The Unit concluded, "the devastating effects of uncontrolled gypsy moth infestations are well documented, and we believe that any potential harm to state and federal listed species resulting from the proposed control measures is less than the potential harm to these same species from an uncontrolled gypsy moth infestation." (Appendix C – IDNR, Memo).

### 3.3 Protection of Historic Properties

The State Historic Preservation Officer did not identify any historic buildings, structures, objects, districts or archaeological resources listed in or eligible for inclusion in the National Register of Historic Places within the probable area of potential effects. Nor did the Officer identify any historic properties within the project area that are listed in the Indiana Register of Historic Sites and Structures or that might otherwise be considered historic as the term is used in Indiana Code 14-21-1-18. (Appendix C – IDNR Letter Division of Historic Preservation and Archaeology).

## 4.0 ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for the comparison of alternatives. It describes the probable consequences (effects) of each alternative for each issue. Environmental consequences are summarized in Table 2 for each combination of the alternatives and issues.

### 4.1 Human Health and Safety (Issue 1).

**Alternative 1 – No action.** For this alternative, there would be no cooperative project, therefore risk of human contact with pheromone flakes or Btk and an aircraft accident during application would not exist. However, future impacts by gypsy moth to human health will occur sooner under Alternative 1 than if treatments are used to slow-the-spread of these gypsy moth populations. Gypsy moth outbreaks have been associated with adverse human health effects, including skin lesions, eye irritation, and respiratory reactions. Gypsy moth caterpillars can become a serious nuisance that can cause psychological stress in some individuals (USDA 1995, Vol. II, p. 4-9).

**Alternative 2 - Btk.** Human exposure to Btk provides little cause for concern about health effects. “On the basis of both the available epidemiology studies as well as the long history of use, no hazard has been identified for members of the general public exposed to Btk formulations” (USDA 1995, Vol. III, p. 4-15). Exposure to Btk may result in temporary eye, skin, and respiratory tract irritation in a few people. A detailed analysis of the risks posed to humans by Btk was conducted for the FEIS -- Human Health Risk Assessment (USDA 1995, Vol. III). Glare and O’Callaghan provide a comprehensive review of *Bacillus thuringiensis*, including Btk. They conclude with this statement, “After covering this vast amount of literature, our view is a qualified verdict of safe to use.” (Glare and O’Callaghan, 2000)

A slight risk of an accident always exists when conducting aerial applications – Btk uses two applications. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, Btk loading, and conditions for safe applications. The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

**Alternative 3 – Mating disruption.** The toxicity of insect pheromones to mammals is relatively low and their activity is target-specific. Therefore the EPA requires less rigorous testing of these products than of conventional insecticides. Risk to human health due to exposure to disparlure, the active ingredient in pheromone flakes, is discussed in the FEIS (USDA 1995, Vol. II, pp. 4-30 to 4-32). Once absorbed through direct contact, disparlure is very persistent in humans, and individuals exposed to disparlure may attract adult male moths for prolonged periods of time. This persistence is viewed as a nuisance and not a health risk (USDA 1995, Vol. III, 8-1). In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5) therefore no effects to human health are anticipated.

A slight risk of an accident always exists when conducting aerial applications – mating disruption uses one application. To further reduce this risk, a detailed work and safety plan is required prior to program implementation, which outlines guidelines for aircraft inspections, pheromone flake loading, and conditions for safe applications. The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

**Alternative 4 – Mass trapping.** The human health effects are not anticipated from the use of disparlure in the delta traps (see Alternative 3 above). The effect of gypsy moth outbreaks on humans would be delayed using this alternative.

**Alternative 5 – Btk, mating disruption, and mass trapping.** The human health and safety consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

#### **4.2 Effects on Nontarget Organisms and Environmental Quality (Issue 2).**

**Alternative 1 – No action.** With no treatments in the current year, future impacts by the gypsy moth would occur sooner. Defoliation by the gypsy moth will cause selective mortality of preferred host trees. During outbreaks, forest ecosystems can change due to a reduction of the oak component and an increase of tree species that are less desired by gypsy moth, such as maple and ash. Oak forests would likely consist of a more mixed composition in the future, though oak would still be a component.

Gypsy moth defoliation and subsequent tree mortality can affect nontarget organisms by dramatically changing habitats on a local scale. Heavy defoliation can remove food for other leaf-feeding species, including other caterpillars. However, it can also create new habitat for some species by creating snags and increasing understory plant development by increasing light penetration into defoliated areas. Impacts on a larger scale (national, regional, or state) are subtle, gradual, and may be noticeable only after many years or decades (USDA 1995, Vol. II, p. 4-74). Short- and long-term changes in nontarget species have been shown for moderate and heavy defoliation (USDA 1995, Vol. II, p. 4-47 and 4-50). An Ecological Risk Assessment (USDA 1995, Vol. IV) examined gypsy moth impacts on a wide variety of species (mammals, birds, reptiles, amphibians, fish, insects, mollusks, crustaceans, and other invertebrates). Further discussion of gypsy moth and its impact on forest conditions can be found in the FEIS (USDA 1995, Vol. II, p. 4- 41 and 4-74).

**Alternative 2 - Btk.** Btk can have direct and indirect impacts on nontarget organisms. Direct toxicity of Btk is generally limited to the larval stage of moth and butterfly species. Btk is not toxic to vertebrates, honeybees, parasitic and predatory insects, and most aquatic invertebrates (USDA 1995, Vol. IV, p. 5-1). Btk has a direct adverse impact on caterpillars of moths and butterflies, but susceptibility varies widely among species. Btk, as used in gypsy moth projects, poses a risk to some spring-feeding caterpillars; however, permanent changes in their populations do not appear likely. An exception may occur in certain habitats that support small isolated populations of a particular species of moth or butterfly that is highly susceptible to Btk (USDA 1995, Vol. II, p. 4-54). The U.S. Fish and Wildlife Service identified two federally endangered butterflies - Karner blue butterfly (*Lycaeides melissa samuelis*) and the Mitchell's satyr butterfly (*Neonympha mitchellii*). However, these species are not known to occur near the treatment sites (Appendix C - U.S. Fish & Wildlife Letter). Thus, no potential exists for Btk to impact these populations directly.

Btk may have an indirect effect on other organisms by a reduction in their food resource (e.g. caterpillars, pupae, or adult moths and butterflies). Any effects on vertebrates due to reduction in food availability are probably subtle, especially for mammals and birds that are very mobile. Populations of some gypsy moth parasites and some general lepidopteran parasites may be reduced, due to the reduction in number of potential hosts caused by the Btk spray (USDA 1995, Vol. IV, p. 5-7). The U.S. Fish and Wildlife letter identified that the treatment sites are within the range of the federally endangered Indiana bat (*Myotis sodalis*), bald eagle (*Haliaeetus leucocephalus*) and copperbelly watersnake (*Nerodia erythrogaster neglecta*). They “conclude that the 2004 program is not likely to adversely affect any of these listed species” due to the relatively small areas of Indiana bat habitat in the Btk spraying, the link between loss of a lepidopteran forage base and adverse effects on Indiana bat is uncertain, and no anticipated impact on the forage base of bald eagles and copperbelly water snakes. (Appendix C – U.S. Fish & Wildlife Letter).

Applications of Btk formulations do not increase levels of Btk in soil, and Btk persists for a relatively short time in the environment. Changes in soil productivity and fertility are not likely in the treatment sites, because Btk occurs naturally in soils worldwide. Additional information concerning the effects to soil can be found in Appendix G of the FEIS (USDA 1995, Vol. IV).

Application of Btk is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

**Alternative 3 – Mating disruption.** The pheromone in the flake dispenser is specific to gypsy moth, and it will not affect other insects, including any threatened and endangered species of butterflies or moths.

A quantitative assessment of risk from mating disruption was not conducted for the FEIS because of disparlure's low toxicity to vertebrates and specificity to gypsy moth. As used in mating disruption, disparlure is not likely to impact nontarget organisms (USDA 1995, Vol. II, p. 4-67). The toxicity of insect pheromones to mammals is relatively low. In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA 1995, Vol. IV, 5-5). At normal application rates, concentration of the pheromone (disparlure) impregnated in the flakes remains active for one season only. Therefore, no effects on nontarget organisms are anticipated from the proposed Disrupt II application.

Most ingredients in the flakes are insoluble in water, so the risk of disparlure leaching into groundwater is minimal. To determine the amount of disparlure that could potentially leach into water, 50 grams of flakes were submerged in 150 ml of water and vigorously agitated for 24 hours. Results indicate that less than 0.04% of the active ingredient (disparlure) contained in the flakes leached into water under these conditions. Disrupt II is applied at doses of 6, 15 or 30 grams of active ingredient (disparlure) per acre and 90% of the flakes are intercepted by and adhere to the forest canopy, where they remain until they have released most of the disparlure.

Using pheromone flakes to disrupt mating is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

**Alternative 4 - Mass trapping.** The pheromone in the delta trap is specific to gypsy moth and will not have an effect on other insects or threatened and endangered species of butterflies or moths. "Mass trapping does not affect nontarget organisms, except those (primarily flying insects) that accidentally find their way into the trap." (USDA 1995, Vol. II, p. A-9).

Mass trapping is likely to maintain the forest condition in the short-term by eliminating gypsy moth populations in the treatment sites, thus delaying gypsy moth from expanding and causing defoliation. In the long-term, gypsy moth will become well established in these counties; even if this alternative is implemented.

**Alternative 5 - Btk, mating disruption, and mass trapping.** The nontarget and environmental consequences stated above for Alternatives 2, 3 and 4 apply to this alternative.

### 4.3 Economic and Political Impacts of Treatment vs. Non-Treatment (Issue 3).

**Alternative 1 – No action.** If no treatments were applied, the likely action would be to implement a quarantine in these counties during the next year. A quarantine would regulate movement of firewood, logs, other timber products, mobile homes, recreational vehicles, trees, shrubs, Christmas trees, and outdoor household articles. This would create a financial impact to industries that deal with these products.

If current populations are not treated, they will continue to reproduce and grow in size. Defoliation would become noticeable in the future, but it would be difficult to predict exactly when noticeable defoliation would occur. Requests for federal assistance to suppress gypsy moth would be likely when defoliation occurs. Suppression projects are generally more expensive in total dollars than eradication projects because much larger areas are treated. The economic impact to state budgets would increase, as responsible agencies would need to administer and fund these suppression projects.

Following defoliation, negative financial impacts are likely to occur for recreational industries such as resorts and campgrounds. Homeowners, private woodland owners, and forest-based industries could be impacted by gypsy moth treatment costs, tree mortality, and adverse human health effects.

**Alternative 4 – Mass trapping.** If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed. Mass trapping is typically used in small areas (less than 40 acres) because it is labor intensive (USDA 1995, Vol. II, p. A8-9). Its use for all treatment sites would be cost prohibitive.

**Alternatives 2 (Btk), 3 (Mating disruption) and 5 (Btk, mating disruption, and mass trapping).** If treatments are applied, regulatory action is not likely for these counties during the next year and the impacts listed under Alternative 1 would be delayed.

Economic analysis from the Slow-The-Spread Program (STS) demonstrated the use of Btk, mating disruption and other STS technology reduced the spread of gypsy moth by as much as 60 percent (Sharov et al. 2002, p. 32). The Eastern Plant Board recognized that the benefit of delaying gypsy moth resulted in an economic benefit of \$22.00 for each dollar invested in treatment cost and that the STS Program protected timber, recreation, and private property values (Eastern Plant Board 1997).

#### 4.4 Likelihood of Success of the Project (Issue 4).

**Alternative 1 – No action.** Project objectives would not be met with this alternative. Gypsy moth would not be eliminated from the treatment sites, and its population would serve as a source for increased spread within the counties and into surrounding counties. If these populations were allowed to increase and expand, gypsy moth could spread through the state in 10 years (Sharov et al. 2002)

**Alternative 2 - Btk.** Project success is likely with this alternative. Btk is effective in eliminating gypsy moth in the treatment sites with low gypsy moth populations.

**Alternative 3 – Mating disruption.** Project success is likely with this alternative in most sites. However, a few sites have gypsy moth populations in core areas above the recommended level for treatment with mating disruption.

**Alternative 4 – Mass trapping.** Project success is likely with this alternative in some sites. However, a few sites have gypsy moth populations in core areas above the recommended level for treatment with mass trapping. Mass trapping is a labor-intensive treatment and sites greater than 40 acres are usually not mass trapped. It would not be feasible to mass trap all treatment sites.

**Alternative 5 - Btk, mating disruption, and mass trapping.** Project success is optimized with this alternative when treatment selection criteria are used to determine the use of Btk, mating disruption or mass trapping alone or in combination for each site. Treatment selection criteria used to evaluate each site are: 1) gypsy moth population level, 2) habitat type (urban, rural, open water or wetland), 3) nontarget organisms, 4) safety, and 5) cost and project efficiency.

#### 4.5 Unavoidable Adverse Effects

No unavoidable adverse effects were identified for the proposed project.

#### 4.6 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources results in the permanent loss of: 1) nonrenewable resources, such as minerals or cultural resources; 2) resources that are renewable only over long periods of time, such as soil productivity; or 3) a species (extinction) (USDA 1995, Vol. II, p. 4-93). Except for Alternative 1, there is an irreversible commitment of labor, fossil fuel, and money spent on the project.

An irretrievable commitment is one in which a resource product or use is lost for a period of time while managing for another (USDA 1995, Vol. II, p. 4-93). For this project, no irretrievable commitments were identified.

#### 4.7 Cumulative

#### Effects

No cumulative effects were identified for this proposed project. Cumulative effects are the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions, that collectively are significant.

Six sites proposed for treatment in 2004 had treatments in previous years. Two Btk sites, Churubusco (Whitley Co.) and Brookwood (Lake Co.), had Btk applied in 2003. Cumulative effects from Btk applications over several years are not anticipated (USDA, 1995, Vol. II, p. 4-16). The Lake Wawasee

(Kosciusko Co.) mating disruption site had mating disruption applied in 2002 and 2001, respectively. The 150 East Btk site (LaPorte Co.) was part of a mating disruption site in 2002. Part of the Juniper Rd mating disruption site (Marshall Co.) had Btk applied in 2003. Cumulative effects from these treatments are not anticipated.

Four sites, Elkhart, Middlebury (Elkhart Co.), Northern Allen County and South West DeKalb, are proposed to receive Btk treatments in core areas and mating disruption over the entire treatment sites. No cumulative effects are known or expected from these multiple treatments. No gypsy moth treatments by the private sector are expected in the state during the current year.

## **4.8 Other Information**

### **Mitigation**

The Cooperative Gypsy Moth Project will implement the following safeguards and mitigating measures:

- News releases of treatments and dates will be given to local newspapers and radio/TV stations.
- Local safety authority will be notified by direct contact or phone calls.
- Employees of state and federal agencies monitoring the treatment will receive training on treatment methods to be able to answer questions from the public.
- Notification will contain information pertinent to the specific treatment, treatment boundaries, treatment schedule, and precautions to be taken.
- Application of Btk will be suspended when school buses are in the site and when children are outside on school grounds.
- Aircraft will be calibrated for accurate application of treatment material.
- Applications will be timed so the most susceptible gypsy moth stage is targeted.
- Weather will be monitored during treatment to assure accurate deposition of the treatment material.

### **Monitoring**

During the treatments, ground observers and/or aerial observers will monitor the application for accuracy within the block perimeters, swath width, and drift. Application information (e.g. swath widths, spray-on and spray-off, acres treated, and altitude) will be downloaded to an operations-base computer.

The Btk and mating disruption treatment sites will be monitored using gypsy moth traps to determine the effectiveness of the treatments.

## 5.0 LIST OF PREPARERS

**Phil Marshall**, Forest Health Specialist, Division of Forestry, Indiana Department of Natural Resources, Vallonia State Nursery, Vallonia, IN 47281.

EA Responsibility: Participated in writing and reviewing the environmental assessment and in the development of the proposed cooperative gypsy moth project.

Experience and Education: Experience as Forest Health Specialist since 1974 and experience in gypsy moth management since 1977. M.F., Duke University in Forest Entomology and Pathology; B.A., Catawba College in pre-forestry.

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## **6.0 LIST OF PERSONS AND AGENCIES CONSULTED**

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